

Amendment and Response Under 37 C.F.R. 1.116

Applicant: Scott C. Willis et al.

Serial No.: 09/591,731

Filed: June 12, 2000

Docket No.: B251.104.102

Title: SYSTEM AND METHOD OF PROVIDING A SPREAD SPECTRUM PULSE WITH MODULATOR CLOCK

REMARKS

The following remarks are made in response to the Final Office Action mailed May 5, 2004. Claims 1-4 and 6-9 have been allowed. Claims 10 and 22-33 were rejected. Claims 5 and 11-21 have been objected to. With this Response, claims 5, 12, 22, and 26-27 have been amended. Claims 1-33 remain pending in the application and are presented for reconsideration and allowance.

Claim Objections

On page 5 of the Office Action, claims 5, 12, and 26-27 were objected to for grammatical informalities. With this response, claims 5, 12, and 26-27 have been amended to address the objections as suggested by the Examiner. As such, Applicants respectfully request that the above claim objections be removed.

Claim Rejections under 35 U.S.C. § 112

Claim 22, and claims 23-30 depending therefrom, were rejected under 35 U.S.C. § 112 for lack of antecedent basis for “the pulse train source” limitation of claim 22. With this response, Applicant has amended claim 22 to provide proper antecedent basis for this limitation. Therefore, Applicants respectfully request withdrawal request that the rejection of claims 22-30 under 35 U.S.C. § 112 be withdrawn and that these claims be allowed.

Claim Rejections under 35 U.S.C. § 103

Claims 10 and 31-32 were rejected under 35 U.S.C. § 103 as being unpatentable over the Turner U.S. Patent No. 5,006,973 patent in view of the Smith U.S. Patent No. 5,309,344.

Claim 33 was rejected under 35 U.S.C. § 103 as being unpatentable over the Turner Patent in view of the Smith Patent and in further view of the Korcharz et al. U.S. Patent No. 6,049,471.

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Applicants respectfully submit that neither the Turner patent nor the Smith patent, either alone or in combination, teach or suggest the claimed invention of independent claim 10. In this regard, the Examiner admits that the Turner patent does not teach a pulse width modulator whose fundamental frequency is time-varying, and relies on the Smith patent to teach this limitation of independent claim 10. However, Applicants respectfully submit that the Turner patent also fails to teach the limitations of independent claim 10 of an altering means coupled between an incrementing means and the resistor/capacitor (RC) network for altering the RC time constant of the RC network based on a binary count to correspondingly time-vary the fundamental frequency of the pulse train signal of the pulse width modulator.

The Turner patent discloses a resonant, pulse width modulated power source 33 that supplies a constant amplitude, constant frequency current to a supply loop 31 that is inductively coupled to a plurality of pick-up loops 31 (column 2, lines 64-68). Precise, fixed-frequency control is achieved by triggering a pulse width modulator (PWM) 49 with fixed-frequency sync pulses provided by an oscillator circuit 47 (column 3, lines 3-6). Oscillator circuit 47 includes a crystal oscillator (CO), a first counter (CNTR1), a second counter (CNTR2), and a flip-flop (FF2) (see Figure 7). CNTR1, CNTR2, and FF2 form a counter that causes an alternating change in the state of a SYNC output, such that the state of the SYNC output changes after a predetermined number of cycles of the crystal oscillator, and wherein the predetermined number of cycles is set by the values stored in CNTR1 and CNTR2 (column 9, line 55 – column 10, line 11).

In the Turner Patent, the PWM includes a resistor control input (RT) and a capacitor control input (CT) that control the frequency of the pulses produced by the PWM (column 10, lines 51-55). A group of resistors R6-R8 and capacitors C23-C25 form an RC circuit that is coupled to control inputs RT and CT and having an RC time constant that determines the frequency of the PWM (see Figure 8). This RC circuit is controllably coupled to a voltage source (+V5) via a transistor Q1 that is controlled by the above described SYNC output (see Figure 8). The SYNC output of the counter formed by CNTR1, CNTR2, and FF2 controls the connection of the PWM to the voltage source through the RC circuit by turning transistor Q1 on

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and off, and thereby controls the triggering of the PWM. The SYNC output from the counter does not cause the RC time constant of the RC circuit to change based on counter's value, but merely causes the PWM to be connected to the voltage source +V5 via the RC circuit, the RC time constant of which is fixed based on the values of resistors R6-R8 and capacitors C23-25. As such, the Turner patent does teach or suggest an altering means, that is separate from the RC network, and coupled between an incrementing means and the resistor/capacitor (RC) network for altering the RC time constant of the RC network based on a binary count to correspondingly time-vary the fundamental frequency of the pulse train signal of the pulse width modulator.

In contrast, the present invention of independent claim 10 includes an altering means separate from an RC network, wherein the altering means is coupled between the incrementing means and the RC network and alters the RC time constant of the RC network based on the binary count of the incrementing means to correspondingly time-vary the fundamental frequency of the pulse train signal of the pulse width modulator. With reference to Figure 2B, in one embodiment of the present invention, the RC network comprises a timing resistor (R_t) 120 and a timing capacitor (C_t) 122, while the alternating means comprises a plurality of resistors (110, 112, 114, and 116) each coupled between separate outputs of a binary counter 108 (such as an up-down counter) and a node C formed by timing resistor 120 and timing capacitor 122. Upon each cycle of a clock (clk), the parallel combination of resistors of the plurality of resistors which are coupled between voltage source V_{cc} via the binary counter and the node C changes and, thus, changes the RC time constant of the RC network coupled to the pulse width modulator. In this manner, the time-varying of the RC time constant correspondingly time-varies the fundamental frequency of the pulse train signal of the pulse width modulator.

In regard to the Smith patent, Applicants respectfully submit that Smith does not teach time varying the fundamental frequency of a pulse width modulator as recited by independent claim 10. The Smith patent describes a dual active clamp converter 100 including a switch control means 180 for providing a substantially zero-voltage switching condition across a primary switching means 180 that is switched at a fixed frequency. Switch control means 180, in one embodiment, comprises a pair of pulse width modulator controllers 950 and 960 that are

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respectively driven by clock signals ϕ_1 and ϕ_2 , wherein the clock signals each have a switch cycle period T (i.e., a fixed frequency) and are phase-shifted 180° relative to one another (column 45, line 64 – column 46, line 10). Clock signals ϕ_1 and ϕ_2 for pulse width modulator controllers 950 and 960 are provided by a dual-clock signal generator 920 that comprises a conventional crystal oscillator for generating a base clock signal. Dual active clamp converter 100 reduces EMI emissions associated with power conversion by switching under near zero-voltage conditions, thereby eliminating EMI noise problems other caused by ripple currents when switching at non-zero voltage conditions (see Abstract and column 2, line 54 – column 3, line 13).

The Examiner points to specific references in the specification of the Smith patent as evidence that the Smith patent teaches time-varying of the pulse width modulator fundamental frequency. In particular, the Examiner points to column 26, lines 14-20 where a switching frequency of 400 kHz is employed by converter 100, and to column 33, lines 45-55 where a switching frequency of 500 kHz is employed by converter 100. However, each of these references describe separate embodiments of converter 100, with each reference providing specific component values tailored to specific operating conditions and parameters, with a switching frequency of 400 kHz being a specified operating parameter of the first-described reference and a switching frequency of 500 kHz being a specified operating parameter of the second-described reference (see column 26, lines 8-35 and column 33, lines 41-57, including Table I). As such, the Smith patent merely teaches operating a pulse width modulator at a fixed fundamental frequency (albeit different frequencies) based on specific operating conditions, and does not teach time-varying the fundamental frequency of a pulse width modulator during operation.

In light of the above, Applicants respectfully submit that neither the Turner patent nor the Smith patent, either alone or in combination, teach or suggest the claimed invention of independent claim 10.

Independent claim 31 includes the limitations of a pulse width modulator whose fundamental frequency is time-varying and of altering a resistor/capacitor time constant based on a binary count, similar to those described above with respect to independent claim 10.

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Therefore, for the reasons cited above with respect to independent claim 10, Applicants respectfully submit that neither the Turner patent nor the Smith patent, either alone or in combination, teach or suggest the claimed invention of independent claim 31.

Furthermore, since dependent claims 32-33 further define patentably distinct independent claim 31, these dependent claims are also believed allowable.

Therefore, Applicants respectfully request that the rejection of claim 10 and 31-33 under 35 U.S.C. § 103 be withdrawn and that these claims be allowed.

Allowable Subject Matter

Claims 1-4 and 6-9 were allowed.

Claims 13-21 were objected to as being dependent upon a rejected base claim, but as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Each of the claims 13-21 depends either directly or indirectly from independent claim 12. As described above, independent claim 12 has been amended to overcome objections based on grammatical informalities. Therefore, Applicants respectfully request that objections to claims 13-21 be withdrawn and that these claims be allowed.

The Examiner objected to claim 11 for being dependent upon a rejected base claim, but as being allowable if rewritten in independent form including all limitations of the base claim and any intervening claims. Applicants agree with the Examiner that claim 11 would be allowable if rewritten in independent form. Nevertheless, in view of the above, Applicants respectfully submit that independent claim 10 is allowable over the cited references. Therefore, as dependent claims 11 further defines patentably distinct independent claim 10, claim 11 is believed to be allowable in dependent form. Therefore, Applicants respectfully request that the objection to dependent claim 11 be removed, and that this claim be allowed in dependent form.

CONCLUSION

In view of the above, Applicants respectfully submit that pending claims 1-33 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration

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and withdrawal of the rejections of claims 10 and 22-23 and the objections of claims 5 and 11-21 and allowance of claims 1-33 is respectfully requested.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 19-0130.

The Examiner is invited to contact the Applicants' Representative at the below-listed telephone number to facilitate prosecution of this application.

Respectfully submitted,

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By their attorneys,

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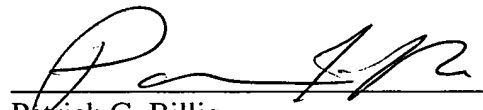
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CERTIFICATE UNDER 37 C.F.R. 1.8: The undersigned hereby certifies that this paper or papers, as described herein, are being deposited in the United States Postal Service, as first class mail, in an envelope address to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 6th day of July, 2004.

By

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